

**Application No.** : 09/890,366  
**Filing Date** : July 26, 2001  
**Amdt. Dated** : November 10, 2003  
**Reply To Office**  
**Action Dated** : May 9, 2003

### **REMARKS**

The foregoing amendments to the specification and the claims are responsive to the May 9, 2003 Office Action in which the Examiner rejects Claims 1-3 under 35 U.S.C. § 102(b) as being anticipated by German Publication No. DE 3206178 to Huber et al. In the alternative, the Examiner rejects Claims 1-3 under 35 U.S.C. § 103(a) as being obvious over Huber et al. As discussed more fully below, Applicants respectfully traverse the Examiner's rejection under 35 U.S.C. § 102(b) and under 35 U.S.C. § 103(a).

#### **Discussion of the Amendments**

By the foregoing amendments, Applicants have canceled Claim 3. In addition, Applicants have deleted a paragraph in the specification on page 6, which has text generally corresponding to Claim 3. Applicants have also amended the title of the invention so that the title more closely conforms with remaining independent Claim 1. No new matter is introduced by the deletion of Claim 3 or by the amendments to the specification and the title.

Please note that the present application is the U.S. national stage of International Application No. PCT/KR00/00049, which was amended on March 31, 2001, during the international stage. Accordingly, the location of the deleted paragraph on page 6 of the specification is based on the text of the amended sheet of the specification submitted on March 31, 2001. Similarly, Claims 1 and 2 were amended on March 31, 2001, during the international stage. Thus, the status identifiers for Claims 1 and 2 are shown as "previously presented."

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## Response to Rejection of Claims

As the basis for rejecting the claims under 35 U.S.C. § 102(b), the Examiner states:

Huber et al. teach depositing glass soot on a *[preform]* using a burner, while, simultaneously exposing soot to laser light that causes the soot to melt together (Fig. 1, English translation of the abstract, page 7, lines 7-25, claims 1 and 10). Moreover, the ejection of the numerous particles of heated glass soot from the burner would inherently produce an agglomeration of the particles around one another such that some of the particles serve as nuclei during the agglomeration. Also, the laser light is clearly shown to be injected through the soot plume as it is deposited (Fig. 1, ref. no. 5 and 4 and abstract). Also, Huber teaches that the laser light is such that the glass absorbs it in order to melt the glass material (page 7, lines 21-25). Thus, it is inherent that the glass soot in the plume would also absorb the laser light passing through it, thereby forming agglomerates of flame and on the deposition surface 3.

The Examiner's rejection under 35 U.S.C. § 102(b) relies in part on the Examiner's assumption that it is inherent that the soot in the flame will absorb laser light and form "agglomerates of flame and on the deposition surface 3." As will be discussed below, Huber et al. do not teach or suggest the formation of agglomeration of particles and it would not be inherent to do so.

As an alternative to relying only on the unfounded inherency argument as support for the rejection under 35 U.S.C. § 102(b), the Examiner also rejects the claims under 35 U.S.C. § 103(a). In particular, the Examiner presents the following argument in support of the rejection under 35 U.S.C. § 103(a):

While the Examiner believes that Huber et al. inherently teaches the limitations of applicant's claims denoted above, in the alternative, it would have been *prima facie* obvious at the time the invention was made that the laser light injected into the soot plume simultaneously with the burner's production of the soot would cause the soot to agglomerate with Huber et al.'s method of depositing soot to form a glass preform because Huber et al. teach that the laser is chosen such that the glass material absorbs it and thus is heated by the laser (page 7, lines 21-25) which means that the soot passing through the laser light would be heated to a point at which it melts together to form agglomerates. Also, Huber et al. *[teach]* that the laser is applied simultaneously with the burner

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deposition of the soot which means that the soot is obviously exposed to the laser light prior to deposition on the surface 3.

Applicants respectfully traverse the Examiner's rejections under 35 U.S.C. § 102(b) and 35 U.S.C. § 103(a) because the rejections are not supported by the cited reference.

The objective of Applicants' claimed invention is entirely different from the objective of Huber et al. In particular, the invention defined in Claim 1 of the present application provides a method of manufacturing much smaller spherical non-agglomerate nanoparticles at higher concentrations than conventional flame aerosol synthesis methods. More specifically, the claimed invention is related to a method for controlling the size, morphology, phase and concentration of fine particles by applying a laser beam onto aerosols (gas borne particles) formed in a flame.

In contrast to Applicants' claimed invention, Huber et al. disclose an apparatus and method for manufacturing a dense optical fiber preform without pores by irradiating a laser beam on to the particles "deposited" on the target made by a VAD method. Therefore, the Huber et al. do not control the size, shape, phase, and concentration of particles growing in flame. The desired product of Huber et al. is a dense, bulk glass preform of optical fibers in contrast to Applicants' claimed invention, which produces fine particles that have controlled sizes, shapes, and phases.

The role and the location of the laser beam in Applicants' claimed invention is completely different from the role and the location of the laser beam in Huber et al. For example, as defined in Claim 1, the laser beam is irradiated onto aggregates existing in a flame (not on the target) so that the temperature of the aggregates rapidly increases to cause the aggregates to fuse (or coalesce) into spheres having the same volume but smaller collision cross sections than the original aggregates. In this way, the claimed invention slows down the growth of fine particles in the flame, therefore eventually producing much smaller and non-agglomerate nanoparticles at higher concentrations

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than conventional flame methods for manufacturing fine particles. In contrast to Applicants' claimed invention, Huber et al. teach a method in which fine glass particles formed in a flame are deposited on the target and are sintered with a laser beam simultaneously with the deposition. The laser beam in Huber et al. is irradiated onto the deposited fine particles (on the substrate). In contrast to the laser beam in Huber et al., the laser beam in Applicants' claimed invention is irradiated onto aggregates existing in a flame (that are not deposited on the substrate or target). The role of the laser beam of Huber et al. is to sinter the deposited fine particles into a dense, bulk glass preform. In contrast, the role of the laser beam of Applicants' claimed invention is to transform the aggregates into spheres, thereby reducing the collision cross sections of growing particles and producing much smaller, spherical, fine particles at higher concentrations than conventional flame synthesis methods.

Claim 1 as previously presented in the international application and as pending in the present application includes limitations that patentably distinguish Claim 1 over the cited reference. In particular, Claim 1 defines the particle nuclei as forming aggregates by colliding with each other in the flame. Similarly, Claim 1 defines the irradiation of the laser beam into the aggregates in the flame, and defines the fusing and sintering of the aggregates into fine particles in the flame. As discussed above, the production of the fine particles in the flame is novel and nonobvious over Huber et al.'s irradiation of fine particles deposited on a substrate to sinter the deposited fine particles into a dense, bulk glass preform.

In view of the foregoing, Applicants respectfully submit that Claim 1 is patentably distinguished over Huber et al. and the other references of record. Applicants respectfully request the Examiner to withdraw the rejection of Claim 1 under 35 U.S.C. § 102(b) and under 35 U.S.C. § 103(a).

Claim 2 depends from Claim 1 and further defines the laser beam of Claim 1 as having a wavelength close to the main absorption wavelength band of the particles

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generated in the flame. In view of patentability of Claim 1 over the cited references, Applicants respectfully submit that Claim 2 is also patentably distinguished over the cited references. Applicants respectfully request the Examiner to withdraw the rejection of Claim 2.

In view of the patentability of Claims 1 and 2, Applicants respectfully request allowance of Claims 1 and 2.

### **Discussion of Canceled Claim 3**

The Examiner's focus on the heating and fusing of the particles deposited on the preform in Huber et al. suggests that the preamble and the last element of Claim 3 may have caused the Examiner to misconstrue the claimed invention as being directed to a method of using a laser beam to fuse particles deposited on a preform. As discussed above, the invention defined in Applicants' Claim 1 is directed to the formation of fine particles in the flame. Notwithstanding the wording of the preamble, Claim 3 was also directed to such formation. The deposition step in Claim 3 occurred after the particles were formed in the flame. Claim 3 has been canceled herein to remove Claim 3 from consideration and thereby preclude further discussion regarding the heating of the deposited particles as disclosed by Huber et al.

In view of the cancellation of Claim 3, the corresponding text summarizing Claim 3 has been deleted from the specification on page 6. In addition, the words "and depositing" have been deleted from the title of the invention to conform the title with the claimed invention.

### **Request For Telephone Interview**

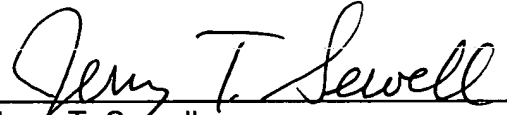
In view of the forgoing, the present application is believed to be in condition for allowance, and such allowance is respectfully requested. If further issues remain to be resolved, Applicants' undersigned attorney of record hereby formally requests a

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telephone interview with the Examiner. Applicants respectfully request the Examiner to call the undersigned attorney of record at 949-721-2849 (direct) or at the general office number listed below.

Respectfully submitted,  
KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: NOVEMBER 10, 2003

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